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(54) Water conservation/recovery system

(57) A water conservation/recovery system comprises, in sequence means (2) for receiving waste water, a purification and cooling means (3, 4) and storage means (5) from where the purified and cooled water may be recovered. The purification means suitably comprises a filter and/or u.v. treatment unit.

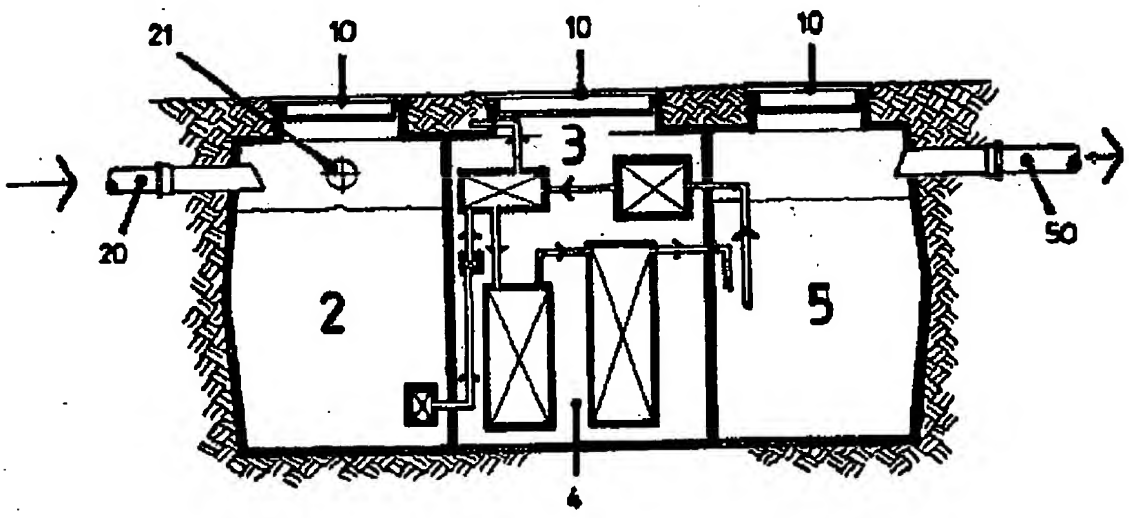

Figure 1

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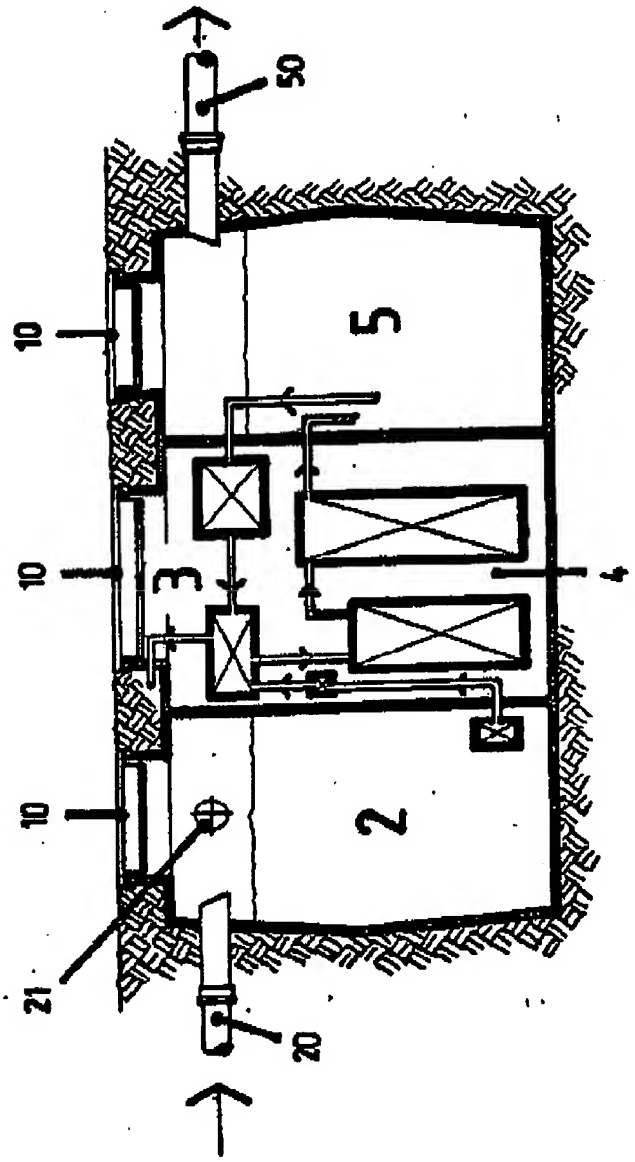

Figure 1

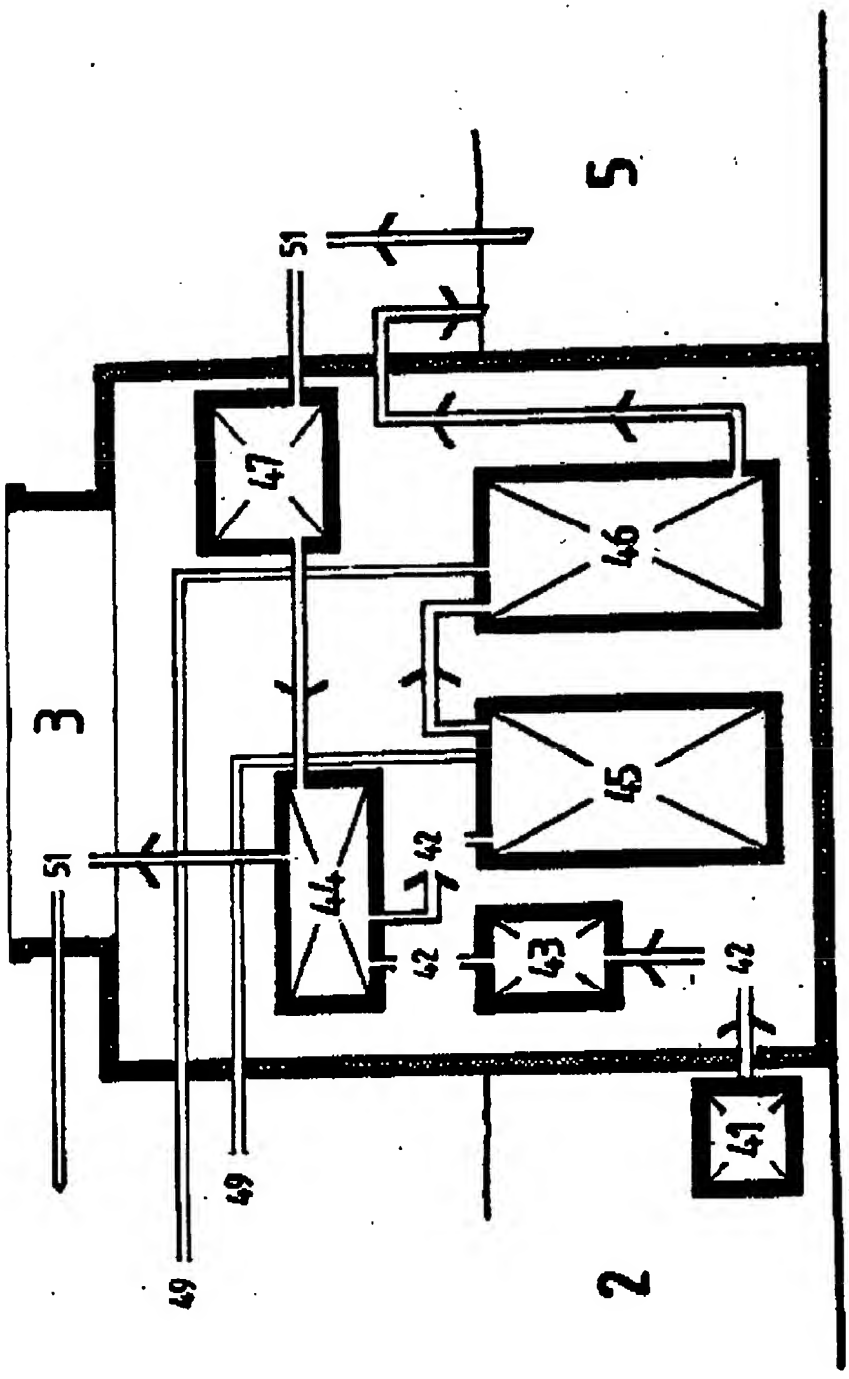

Figure 2

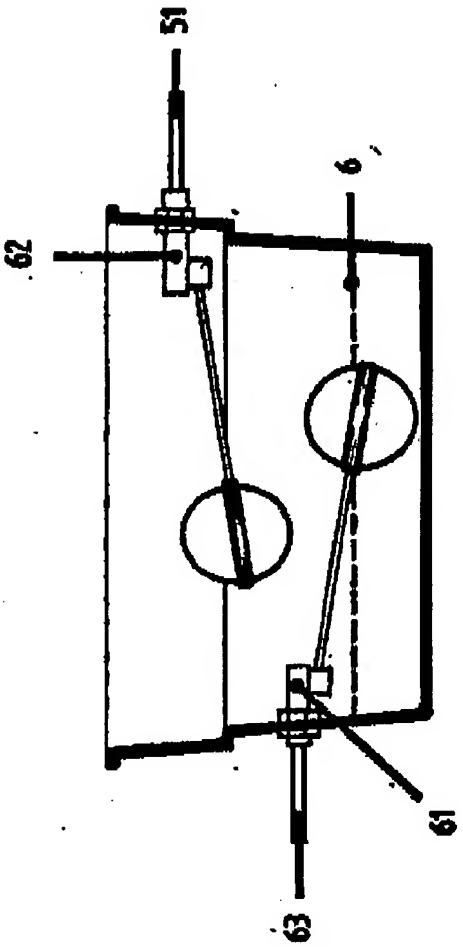

Figure 3

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Water Conservation.

This invention relates to water conservation, and may find application in the recovery of water which has been used but which has not been heavily contaminated, by purifying it at a location at or close to the point of use, and returning the purified and cold drinking water to the point of use or a location close to the point of use.

The balance between the supply and the consumption of purified cold water in any particular area of the world depends on many factors. In a non-industrial area, water consumption is essentially determined by population density, together with average usage per head, and the latter would be expected to be a function of availability and cost of supply, and the average standard of living in that area, for example. Industrial requirements, on the other hand, are influenced by particular processes involved and the efficiency with which they are operated, inter alia.

In many regions these and other factors are such as produce a tendency for total purified and cold water consumption to increase.

Purified and cold water is easily obtained from relatively pure sources, although in some regions of the world other sources are used, e.g. sea water which is desalinated. Virtually all relatively pure water sources are ultimately derived from precipitation, whether this is used directly (Surface rain or melt water, rivers) or indirectly (stored in aquifers). Direct use is limited by precipitation rate, and indirect use, while initially providing another supply, is also limited thereby in the long term, because otherwise the stored water is not replenished. Thus as many regions are experiencing, it is difficult to ensure that an increasing demand for clean cold water is still met satisfactorily, and the importation of water from other areas and/or the adoption of less pure water sources are strategies which come under consideration. For example used water is returned to a water course and extracted down stream by another water treatment plant. However such strategies generally involve increased expense and difficulty, for example in the purification processes and/or in the sheer volume of water which has to be moved or processed. In addition, there may well be concern that climatic shifts will lead to decreasing local precipitation, thereby creating more adverse water balance.

Much water issuing as waste from both domestic and industrial consumers is only lightly contaminated (for example, waste from wash hand basins and baths, and the effluent from a bottlewashing plant), and yet it is combined with more heavily polluted water and then has to undergo the same purification process if it has to be reused. In the domestic context, it is believed that about 70% of the total water supplied forms such lightly contaminated waste. This is generally inefficient, and is one problem which can be addressed by the present invention.

If lightly contaminated water and/or local precipitation can be collected and purified locally, for local use, a number of benefits can follow. Where water is charged by volume, water bills can be reduced or water more freely used without penalty. this may be of particular interest to industrial users, for example bottle washing plants referred to above or for running large offices and related organisations. but could also help domestic users. It would also enable domestic users meet any hose pipe or sprinkler ban for garden or car washing use.

The demand for water from the water companies would also be reduced. This would reduce their waste intake, and in view of the difficulties which some companies are experiencing in identifying new sources of water to process, and the drastic lowering of the water table in some localities, which among other things has seen some river beds virtually dry up, even the companies might not consider this to be undesirable. As a consequence, the amount of water which the water companies need to process would also fall. the amount of water which sewage companies would need to process would also be reduced.

From one aspect, the invention provides a local water management system comprising recovery means for recovering waste water from the first point of use and/or surface water from a collection point in the local vicinity of the first point, and storing it in a container, a water purification system in the local vicinity of the first point of use, connected to receive water stored in the said container, and returning means including at least one storage tank connected to receive water from the outlet of the purification system.

The said at least one storage tank may be serially connected between the outlet of the purification system and the first point of use, or between the outlet of the purification system and a second point of use in the local vicinity of the first point.

It will normally be found preferable for the returning means to be arranged so that it also receives additional water from a remote source, for example mains water or even water from a desalination plant, so that when the input to the container or the output of water from the purification and cooling system is insufficient to meet the demand, this additional water acts as a supplement.

The additional water may be supplied to the point of use without storage. Alternatively however, it may be received and stored in the said tank of the returning means, as indicated in more detail hereafter.

Pump means may be provided for pumping water from the recovery means through the purification system to the returning means and/or for supplying purified water to the first or second point of use.

Preferably the purification system comprises at least one filter for removing particulate matter and/or a reverse osmosis filter an/or an ultra violet treatment unit. Preferably all three types of filter are present. The osmosis filter should be placed to act after the particulate matter has been removed; the ultra violet filter will be located at any position relative to the other filters.

The system will comprise an integral structure having at least two separate compartments defined therein, the compartments being occupied by, or providing, at least two of the of the purification system, the container, and a said storage tank.

Thus from a second aspect the invention provides a module for use in a system according to the first aspect, comprising an integral structure having at least two compartments, at least one said compartment forming a water tank, and water purification system being located in at least one said compartment.

The above and other aspects of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a schematic cross section of an integral structure incorporating a water purification system and water tanks which may be used for example in a domestic water management system according to the present system;

Figure 2 is an enlarged and somewhat more detailed view of the purification system shown in figure 1; and

Figure 3 is a cross sectional view of a storage tank which may be used in the water management system of the present invention..

Figure 1 shows part of a water management system suitable for a house, for example. A tank 1 having three separate compartments each with an access lid 10 is shown fitted at and below ground level, and is placed in the vicinity of the house. This tank is typically of plastics or fibre glass material, although it could be constructed of other materials such as concrete.

A pipe 20 serves to direct waste and/or surface water to a first compartment 2. The waste water will be typically be derived from the outlets of hand basins and baths within the house, but not more heavily soiled water from water closets. The surface water may be obtained from gutters, trapped gulleys, and/or ground drainage channels in forecourts, drives, car parking areas etc.

A water purification system 4 is essentially located in compartment 3, but includes a course partical filter 41 located in compartment 2. (A course filter at the input to compartment 2 could replace or supplement filter 41).A pipe 42 directs the the water from the filter 41 via an ultra violet filter 43 and a pump 44 to a fine partical filter 45, typically a sand filter. The output of the filter 45 is connected through a reverse osmosis filter 46 to a storage tank defined by the third compartment 5. Both filters 45 and 46 have backwash facilities whereby accumulated contaminants may be flushed via pipes 49 to a conventional waste (soil drainage system). Compartment 2 has an overflow 21 for directing excess water to a conventional soil drainage system, if necessary, although the system would be designed so that under normal circumstances all water directed to the compartment 5 via the filter.

Water from the third compartment is directed by pipes 51 and the pump 44 via a variable cooling system 47 direct to the cold taps within the building for drinking water as would be the supply from the water company. The supply would also be used for any other domestic purpose. The same supply would in any event continue direct to the cold water tank 6 (Figure 3) in the house. The third compartment has an overflow 50 so that excess water supplied thereto may be led away, preferably to a soakaway so that ground water sources may be replenished; a non-return valve may be necessary.

The tank 6 contains a lower ball valve 61 for receiving mains water through pipe 63 from the water company. The purified water from the third compartment 5 is pumped through pipe 51 to an upper ball valve 62, and so fed to the tank 6 in preference to the mains water. The upper ball valve may contain an actuator switch for operating the pump 44.

Clearly this system may be easily adapted to meet different circumstances. Where an integral structure such as tank 1 is provided, the whole of the purification system, including the filter 41 could occupy its own compartment.
However it is equally possible for a part or parts of the purification system to be located in one compartment (as occurs for filter 41) or both compartments 2 and 5: if all of the purification system is so located, the central compartment 3 may be omitted.

Ideally the purification system is easily accessible for servicing, and in view of this and the fact that electrical components may be involved, it may be found preferable omit both the central compartment 3 and the purification system, and locate the latter above ground, for example in a separate compartment. Alternatively, the whole of the structure 1 could be placed above ground.

For larger installations, for example large office blocks, industrial units and factories, it would be advantageous to provide and install the tanks and/or the different parts of the water purification system as individual components.

Although a single pump 44, which would be of the twin impeller type, as shown, separate pumps could be provided for the waste water and the cooled purified water. Alternatively at least one such pump may be omitted if the various components are arranged so that gravity flow can occur. Thus the tanks for the used and purified water might be relatively vertically displaced.

The mains water input has been described as passing through the tank 6. The tank could be omitted and the purified water used to supplement the mains supply at the point of use. The pump will produce sufficient pressure to allow the purified water to be injected at the point of use. The above system installation would in any event comply with the relevant water companies and the public health regulations to date.

Of course, the purified water can additionally or alternatively be supplied to a different point of use
This has already been mentioned in connection with domestic gardening and car washing, and would occur with a conventionally connected wash hand basin or other application receiving an additional supply of the purified water at a separate tap; another example would be a garden centre where plants are regularly watered, and the excess water is collected and passed through the purification system for re-use elsewhere in the same garden centre.

The system may be considered to be particularly advantageous when fresh water supplies are scarce, and when even the water supplied to the first point of use may be derived from a costly source such as a desalination plant.

The invention has unlimited applications.

Claims

1). A local water management system comprising recovery means for recovering waste water from the first point of use and/or surface water from a collection point of use and/or surface water from a collection point in the local vicinity of the first point, and storing it in a container, a cold water purification system in the local vicinity of the first point of use, connected to receive cold water stored in said container, and returning means including at least one storage tank connected to receive water from the outlet of the purification and cooling system.

2). A local water management system according to claim 1 wherein said at least one storage tank is serially connected between the outlet of the purification system and the first point of use, or between the outlet of the purification system and a second point of use in the local vicinity of the first point.

3). A local water management system according to claim 1 or claim 2 wherein the returning means is also arranged to receive water from a remote source.

4). A local management system according to claim 3 wherein the water from a remote source is received and stored in the said storage tank.

5). A local water management system according to any preceding claim and comprising an integral structure having at least two separate compartments defined therein which are occupied by, or provide, at least two of the purification and cooling system, the container, and a said storage tank.

6). A local water management system according to any preceding claim and including pump means for pumping water from the recovery means through the purification and cooling system to the returning means.

7). A local water management system according to any preceding claim wherein the returning means includes pump means for supplying purified cold water to the first or the second point of use.

8). The local management system according to any preceding claim wherein the purification system comprises at least one filter for removing particulate matter.

9). A local water management system according to any one of claims 1 to 7 wherein the purification system comprises a reverse osmosis filter.

10). A local water management system according to claim 9 wherein the reverse osmosis filter is preceded by at least one filter for removing particulate matter.

11). A local water management system according to any preceding claim wherein the purification system includes an ultra violet treatment unit.

12). A local management system according to any preceding claim wherein the system includes an variable cooling system.

13). A local management system substantially as hereinbefore described with reference to the accompanying drawings.

14). A module for use in a system according to claim 1 comprising an integral structure having at least two compartments, at least one said compartment forming a water tank, and a water purification cooling system being located in at least one said compartment.

15). A module according to claim 14 and substantially as hereinbefore described with reference to figures 1 and 2 of the accompanying drawings.